



# **Executive Behavior Validation Study**

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## 1.0 Executive Summary

NASA's Office of the Chief Engineer has conducted two qualitative studies to identify characteristics or behaviors frequently observed in highly regarded systems engineers and technical executives. The purpose of those studies was to develop a shared understanding and agreement across the agency regarding the practice of systems engineering, a core competency critical to NASA's success, and of the behaviors and attributes that enable highly regarded technical managers and executives to be successful.

The first study, the *NASA Systems Engineering Behavior Study*, was conducted in 2008 and included 38 civil servants in systems engineering roles at NASA field centers. The second study, *Executive Leadership at NASA: A Behavioral Framework*, conducted in 2008 and 2009, investigated behaviors and attributes of 14 NASA executives at NASA Headquarters and field centers whom agency leadership identified as highly effective in their roles, and who possessed a technical background or systems orientation that contributed to their success. Study methodology and protocol for both studies included interviewing, observing, and shadowing participants. Findings of the second study reinforced and extended those of the first study and produced 55 behaviors deemed to be essential to successful leadership. These behaviors were organized into six dimensions. For copies of the two studies, please see:

- [http://www.nasa.gov/news/reports/NASA\\_SE\\_Behavior\\_Study.html](http://www.nasa.gov/news/reports/NASA_SE_Behavior_Study.html) and,
- [http://www.nasa.gov/offices/oce/appel/seldp/resources/exec\\_leadership.html](http://www.nasa.gov/offices/oce/appel/seldp/resources/exec_leadership.html).

This is the third study in this sequence. The *Executive Behavior Validation Study* was undertaken to confirm, in a quantitative and large scale manner, the behavioral framework developed after the second small scale qualitative study. The set of 55 behaviors from that study were used to develop an online questionnaire, which was constructed to obtain two types of information from respondents: (1) the perceived importance of each behavior for successful leadership, and (2) their self-assessed skill level with respect to each behavior. Job titles in the registration list of an annual learning and knowledge-sharing event were examined in order to select individuals at an executive or managerial level. In February, 2011, 746 individuals who were thus selected were invited to participate in this study via an online questionnaire and 252 responded for a 34% response rate.

The importance ratings for the 55 behaviors were examined using correlations and a series of factor analyses in order to evaluate the underlying structure. Based on these analyses, conducted on both the entire sample and on a subset of 95 executives, the original 55 items were reduced to 26 items. These were organized into three related factors: (1) Supporting and Connecting, (2) Problem Solving, and (3) Political Savvy/Strategic Thinking. Each set of items demonstrated high internal consistency. Although the results did not corroborate the qualitatively derived six dimensions of executive behaviors, the reduced set of items in three dimensions is cleaner in structure. This reduced set of important, prioritized, executive behaviors will enable NASA to more effectively target critical development areas. A revised behavioral self-assessment reflecting these most important, core behaviors, will be easier for executives to understand. Also, tracking self-assessments on these behaviors will facilitate data collection in future studies.

## 2.0 Introduction

### 2.1 Purpose

The main purpose of this study, the *Executive Behavior Validation Study*, was twofold: (1) to assess in a quantitative manner the structure of the six dimensions constructed from 55 observed behaviors through a small scale qualitative study, and (2) to identify and prioritize the original list of 55 behaviors of highly successful technical executives in order to target developmental strategies and to refine the self-assessment used to identify developmental needs.

The end result would be a revised instrument to gather reliable data on technical executives' perceptions of what behaviors and attributes are important to their roles and what levels of proficiency they have reached in those behaviors. Such data collection efforts should assist in understanding the "art of systems engineering." The instrument should also be of assistance in workshops and training sessions to facilitate discussions of relative importance of different behaviors of highly successful executives.

A secondary purpose was to examine the resulting data and quantify the importance of the behaviors and the levels of self-described proficiency for a large group of individuals working in technical areas so as to develop a baseline of perceived importance and skill level. Additionally, comparisons based on both importance ratings and levels of proficiency could be made between executives and non-executive operating at a managerial level.

The results will extend the extensive qualitative work already done by NASA's Office of the Chief Engineer. Results from this study will provide information about what skill sets are deemed to be most important as well as which skill sets may be in need of improvement. Such information will be used to facilitate the development of these critical behaviors in a more targeted manner in order to enhance the likelihood of mission success and to develop the next generation of highly successful NASA executives.

### 2.2 Background

NASA's Academy of Program, Project and Engineering Leadership (APPEL) developed a 55 item questionnaire based on the observational study *Executive Leadership at NASA: A Behavioral Framework* (Williams et al., 2010). The items represent behaviors organized into six thematic categories that emerged from the observational study. For each item, respondents assessed their own skill level and rated the importance of the listed behavior for being an effective executive.

In September 2010, the Academy piloted the questionnaire with members of the Project Management Institute's Global Executive Council who attended an international conference. After making some modifications to the questionnaire based on participant feedback, APPEL conducted a large scale survey in February 2011 in order to have sufficient data to validate the six thematic categories. This report summarizes the results of that study.

## 3.0 Method

### 3.1 Participant Selection

Over 1700 national and international leaders who work in government, industry, or academic settings registered for an annual learning and knowledge-sharing event. Of these, 721 who were identified as being technical managers or executives based on their job titles received an email invitation to participate in the study and an additional 25 people who qualified were added during the two-day meeting. Although this was not a random sample, the purposeful nature of the selection was critical to constructing a potential participant pool of individuals who operated at a managerial level or higher. Of the 746 individuals invited to participate in the *NASA Executive Behavior Validation Study*, 252 responded to the online questionnaire for a 34% response rate.

### 3.2 Analyses

Analyses were performed using SPSS, version 17.0. Additionally, exploratory factor analyses were also performed using JMP, version 9.0, in order to confirm findings. Descriptive statistics were conducted on demographic items and to check for missing data. Factor analysis, Pearson correlations, and reliability analyses were conducted to evaluate the dimensionality of the importance ratings of 55 items. Additionally, a multivariate analysis of variance (MANOVA) was used to compare executive and non-executive responses and on the set of three scale scores. This was followed by independent sample t-tests on the scale scores individually.

When conducting exploratory factor analysis, several decisions need to be made about: (1) the method of extracting factors, (2) the number of factors to be retained, (3) the rotation method to use, and (4) the size of the sample relative to the number of items. For exploratory factor analysis, there are no absolute standards but numerous guidelines. Costello and Osborne (2005) wrote a thorough guide to best practices for exploratory factor analysis. These were used in this study.

Only 219 of the 252 respondents (87%) provided importance ratings on all 55 items. Including all the items in a factor analysis would mean a 4:1 subject to item ratio, which is on the very low side for a valid factor analysis. However, two initial analyses were performed using all 55 items. First, extracting factors with eigenvalues greater than one resulted in 15 factors explaining 67% of the variance. However, 7 factors were trivial, with only 1 or 2 items attaining loadings greater than .30. Second, to correspond with the number of dimensions from the qualitative study, six factors were extracted. These explained 48% of the variance, but item groupings were not consistent with the six original dimensions and half of the items loaded on a single factor. Neither result produced an appropriate structure. The next set of analyses, with more robust subject to item ratios, were separate factor analyses of the items within each original dimension: (1) leadership (12 items), (2) attitudes and attributes (6 items), (3) communication (13 items), (4) problem solving and systems thinking (14 items), (5) political savvy (5 items), and (6) strategic thinking (5 items).

A number of factor analyses were run on the entire sample for each of the six sets of items using three extraction methods (principle axis factoring, maximum likelihood factoring, and principal

components) and both varimax and direct oblimin rotation in order to check for consistency of results. Items that cross loaded on multiple factors or were unique to a single factor were removed and analyses rerun in an attempt to find unidimensional subsets. Additional factor analyses were run on the executive group for the reduced sets of items. Ratio of items to subjects for factor analyses ranged from 31:1 to 50:1 for the entire group and from 13:1 to 19:1 for the executive group. Although the executive group was relatively small ( $n = 95$ ), these analyses confirmed results from the entire group. Correlation tables for both the whole group and the executive group were examined to help determine patterns of relationships and assist with refinement and interpretation of factor analysis results. Finally, Cronbach's alpha reliability measure was used to determine the internal consistency of each resulting set of items.

## 4.0 Findings

### 4.1 Participant Profile

Over half of the 252 respondents (54%) worked for the government, 21% worked for industry, and 7% were contractors. An additional 7% worked for various non-profit, professional, or educational institutions. Over one third said that the scope of their organization was national (39%), 23% said it was global, and 21% said it was multinational (12% did not respond).

Six percent had titles of President, CEO, CFO, or CIO, 5% were Vice Presidents, and 3% were Executive Officers. An equal percent of respondents held the position of Director or Project Manager (19% each), 13% were Program Managers and 12% held other managerial positions. The largest group of respondents had responsibility at either the project level (24%) or the program level (21%). Fifteen percent were at the Corporate or Agency level, 16% at the Corporate Division or Mission Directorate level, and 10% at the Region or Center level.

About half of the respondents said they had shared decision-making authority (47%), while 29% said they had total authority and 12% said they had little decision-making authority. With respect to the number of people under their leadership, almost one-third supervised between one and 20 people (32%), 27% supervised 21 to 100 people, 12% supervised 101 to 500 people, and 7% had responsibility for over 500 people.

This was a highly educated group, with almost half having master's degrees (48%) and an additional 11% having doctorates, while 22% had a bachelor's degree. Six people (2.4%) had courses or certificates beyond the bachelor's and six had post-doctoral work. Most had worked for between one to five organizations in their career (46%), with a third having worked for between six to 10 organizations, and only 9% had worked for more than 10 organizations. Only one-quarter of the group indicated they were female, 63% indicated they were male, and 12% did not specify their gender. Their ages ranged from 31 to 79, with a mean of 52. The respondents were predominantly from the United States (78%), with only 4% from Europe. Five other regions were represented by only one to four respondents each.

Based on the entire sample, only 39% said they were NASA civil servants and only 38% said they operated at the executive level. However, of the 217 who answered both questions, 43% said they worked for NASA and 44% said they operated at the executive level. There was a statistically significant but relatively weak relationship between employment and level ( $\chi^2 =$

14.38,  $p < .001$ ; phi correlation = .26). Of the 93 NASA employees, only 29% were at the executive level, but of the 124 non-NASA respondents, 55% were at the executive level.

## 4.2 Revised Item Sets based on Factor Analysis

Based on multiple sets of factor analyses, the set of 55 items in the original NASA Executive Behavior Validation instrument were reduced to 26 items in three related factors, representing three dimensions of executive behavior, which were labeled: Supporting and Connecting (10 items), Problem Solving (6 items), and Political Savvy/Strategic Thinking (10 items).

The items in these three sets were re-analyzed using both the entire sample and the executive group. A measure of sampling adequacy used to predict if data are likely to factor well is the Kaiser-Meyer-Olkin (KMO) statistic. KMO values range from 0 to 1.0 and should be .60 or higher in order to proceed with a factor analysis. Values of .80 or higher are desirable. They were above .90 for the revised item sets. Internal consistency reliabilities were also high for each set of items (.88, .82, and .90, respectively). Table 1 contains the items in the revised categories. Five of the Supporting and Connecting items came from the original leadership set, four from the communications set, and one from the original problem solving and systems thinking. All six Problem Solving items were a subset of the original problem solving and systems thinking set. The new Political Savvy/Strategic Thinking combined all the items from what was originally organized into separate sets.

### Deleted Items

The remaining 29 of the original behaviors may have merit in and of themselves, but they did not provide any viable sub-scale grouping with adequate measurement properties. Additionally, while the reliabilities for various subsets of these items were not terrible, they were rather low. The KMOs for all but the set of attitudes and attribute items were in the “middling” range (.70-.79). For the executive group, the KMO for even this set fell to the middling range. The best variance explained by any subset of these items was only 41%, and the lowest was 28%. Examination of the correlation tables made evident that these 29 items do not have enough in common to justify using them in common groupings.

Consider that only one of the 21 correlations in the original set of leadership items was as high as .40, which is not a strong correlation. It represents only 16% of shared variance. The KMO results for the set of attitudes and attribute items indicate that a factor analysis is appropriate with these data. However, the pattern of correlations, communalities, and factor loadings, as well as the very low variance explained and low reliability, would warrant caution about using a scale mean based on this set of items. Five items within the original communication set seemed promising, but a single factor explained only 41% of the variance in this set, which is quite low. As originally configured, the set of problem solving and systems thinking items did not seem to represent a related, common theme. Only 4 of the 15 correlations were higher than .40. Even a factor consisting of the seemingly most cohesive subset only explained 40% of the variance, but that set of four items exhibited low internal consistency ( $\alpha = .72$ ).

While the relationships between item pairs within each of the above sets of items were extremely low, it might be supposed that some of these items might relate to items in other sets. To explore this possibility, the correlation matrix of this entire set of items was inspected. This showed that

less than 10% of all the pair-wise correlations were greater than .40, with the strongest correlation only reaching .50. These analyses confirmed the reduction of the 55 item instrument to the 26 items that grouped together well into three related dimensions.

**Table 1 Revised behavioral item sets in three dimensions**

| <b>A. Supporting &amp; Connecting</b> | <b>10-item scale</b>   | <b>reliability = .88</b> |
|---------------------------------------|--|--------------------------|
| 1.                                    | <b>Develop Employee Capabilities:</b> Provide resources, support and encouragement to employees for development; give work assignments that stretch them. Deliver objective, non-judgmental, constructive corrective feedback. |                          |
| 2.                                    | <b>Reduce Distractions:</b> Deal with issues and problems that would otherwise be a source of distraction for staff.   |                          |
| 3.                                    | <b>Aware of Self and Values:</b> Know personal strengths, limitations and motivations and when to consult others. Be aware of blind spots or biases and articulate values.   |                          |
| 4.                                    | <b>Develop Self:</b> Maintain basic working knowledge of technical discipline, conducting bench marking with pertinent organizations. Develop a learning plan for position/new roles.  |                          |
| 5.                                    | <b>Let Go of Current Role to Prepare for New One:</b> Willing to relinquish familiar job functions and develop skills and knowledge necessary to grow and advance to the next level of leadership.                             |                          |
| 6.                                    | <b>Strive for Clarity:</b> Use clear language; compare and contrast ideas; summarize decisions and agreements at meetings.   |                          |
| 7.                                    | <b>Ensure Understanding:</b> Solicit feedback to check for understanding; align verbal and nonverbal messages.   |                          |
| 8.                                    | <b>Assess Context:</b> Know when and how often to communicate. Sense others' needs and strike the right balance in communicating what is needed, but not more.   |                          |
| 9.                                    | <b>Encourage Participation:</b> Ensure all opinions are solicited. Use facilitation, coaching, or dialogue skills. Ask open-ended questions. Sense when opinions are being suppressed.   |                          |
| 10.                                   | <b>Remain Open-Minded and Objective:</b> Receptive to diverse and dissenting opinions; willing to re-think/re-work an issue or to change direction.  |                          |
| <b>B. Problem Solving</b>             | <b>6 item scale</b>  | <b>reliability = .82</b> |
| 11.                                   | <b>Find Connections and Patterns:</b> Observe system interfaces and ripple effects of changing requirements/ elements; locate/correct sub-system 'disconnects' or 'inconsistencies.'   |                          |
| 12.                                   | <b>Assimilate, Analyze, and Synthesize Data and Information:</b> Assimilate and distill large quantities of data from across organization, break data down, establish parameters, set priorities, and synthesize.              |                          |
| 13.                                   | <b>Validate Facts, Information and Assumptions:</b> Question assumptions, anticipate problems, and recognize data have limitation  |                          |
| 14.                                   | <b>Consider All Options before Deciding:</b> Actively seek and weigh different perspectives. Look at all aspects of the organizational system.   |                          |
| 15.                                   | <b>Identify, Assess, and Manage Risk:</b> Manage risk as an ongoing process: ask questions, identify worst-case scenarios, test methods, and develop mitigation strategies.  |                          |
| 16.                                   | <b>Acknowledge and Manage Uncertainty:</b> Analyze failures and openly and honestly discuss successes, failures, and lessons learned.  |                          |

| <b>Table 1 (continued)</b>                         |   |  |
|--|---|--|
| <b>C. Political Savvy &amp; Strategic Thinking</b> | <b>10 item scale</b>  | <b>reliability = .90</b>   |
| 17.  | <b>Know How the Political System Works:</b>                                 | Know who makes decisions and what they need to make them. Have a keen sense of timing when opportunities arise.  |
| 18.  | <b>Have Political Staying Power:</b>  | Able to maintain momentum over many years. Assess political and budget realities in context.   |
| 19.  | <b>Represent/Promote Organization's Programs across Political Spectrum:</b> | Understand and effectively communicate with government leadership on how programs meet organizational and national needs. Explain consequences and implications of organization's decisions.                   |
| 20.  | <b>Manage Multiple Demands/ Opportunities:</b>                              | Balance needs and political interests of internal and external stakeholders. Be aware of what is important to management and other key players and keep them informed on pertinent matters.                    |
| 21.  | <b>Provide Historical Perspective:</b>                                      | Help others see and understand historical progression of strategies and decisions. Use/promote lessons learned to avoid repeating mistakes.  |
| 22.  | <b>Maintain an Organization-Wide View:</b>                                  | Make decisions by keeping the big picture and working the larger organizational trade space.   |
| 23.  | <b>Manage Near-Term and Long-Term Goals:</b>                                | Proactively anticipate and position the organization years in advance; set a path and stick to it for extended time period   |
| 24.  | <b>Understand Broad Implications of Activities at Multiple Levels:</b>      | Understand where the organization's mission connects to other organizations; seek connections and partnership; share information and communicate on shared goals and projects.                                 |
| 25.  | <b>Monitor the Environment:</b>   | Monitor the external environment to understand issues, priorities or actions that may impact the organization. Work with others with mutual interests to leverage overall program investments.                 |
| 26.  | <b>Use Networks:</b>  | Build and use informal networks to validate and gain additional information, looking to many different sources to be sure issues are covered and connecting organizations and individuals to accomplish goals. |

### 4.3 Sub-scale Mean Responses and Correlations

Mean responses for both perceived importance and self-assessed skill level are presented in Table 2 for the entire group of 252 respondents, as well as for two self-identified groups: 95 executives and 122 non-executives (35 respondents did not self-identify with either category).

Based on a response scale from 1 = very low to 5 = very high importance for each item, the three dimensions of executive behavior were all seen as fairly important to an almost equal degree, averaging 4.0, 4.1, and 4.2. Also based on a response scale from 1 = very low to 5 = very high, the self-assessed skill level means were all slightly lower than 4 points, but still reasonably high. Although differences were relatively minor, Political Savvy/Strategic Thinking had the highest mean for importance (4.2), while Problem Solving had the highest mean for skill level (3.9). Mean scores for the 29 items that were eliminated via factor analysis were equivalent to the highest mean in both subscale sets.

**Table 2. Subscale means for perceived importance and self-assessed skill level of three dimensions of executive behaviors by executives and non-executives**

| Subscales                          | N   | Mean (sd)   |            |                | Mean difference | t    | p     |
|------------------------------------|-----|-------------|------------|----------------|-----------------|------|-------|
|                                    |     | Total group | Executives | Non-executives |                 |      |       |
| <b>Importance Means</b>            |     |             |            |                |                 |      |       |
| Supporting and Connecting          | 251 | 4.0 (.5)    | 4.0 (.5)   | 3.9 (.5)       | .11             | 1.50 | .14   |
| Problem Solving                    | 225 | 4.1 (.5)    | 4.1 (.6)   | 4.0 (.5)       | .09             | 1.21 | .23   |
| Political Savvy/Strategic Thinking | 224 | 4.2 (.5)    | 4.2 (.6)   | 4.1 (.5)       | .07             | 0.94 | .35   |
| Original items not in scales       | 251 | 4.2 (.4)    |            |                |                 |      |       |
| <b>Skill Level Means</b>           |     |             |            |                |                 |      |       |
| Supporting and Connecting          | 252 | 3.7 (.5)    | 3.8 (.5)   | 3.7 (.4)       | .13             | 1.98 | .05*  |
| Problem Solving                    | 225 | 3.9 (.5)    | 4.0 (.5)   | 3.8 (.5)       | .19             | 2.68 | .01** |
| Political Savvy/Strategic Thinking | 224 | 3.7 (.6)    | 3.8 (.6)   | 3.6 (.6)       | .24             | 2.85 | .01** |
| Original items not in scales       | 252 | 3.9 (.4)    |            |                |                 |      |       |

A multivariate analysis of variance (MANOVA) indicated that there was no statistically significant difference between the two groups on the set of three importance subscale scores (Wilks' Lambda = .989 &  $F(3,212) = 0.80, p = .50$ ). The very small higher mean scores for the executive group were not statistically different from the means in the non-executive group. There was a statistically significant difference between the two groups on the set of three skill level subscale scores (Wilks' Lambda = .958 &  $F(3,212) = 3.09, p = .03$ ). As would be expected, subscale means for skill level were all somewhat higher for executives than for the non-executive group. Follow-up *t*-tests provided similar results for the individual subscales, indicating no differences for each of the three importance means, but statistically significant differences for each of the three skill level means.

As shown in Table 3, the three sub-scale scores were all moderately related to each other, more so for the importance subscale means than for the skill level means.

**Table 3 Correlations for sub-scale mean scores**

|                                       | Correlations on Importance Means |     |   | Correlations on Skill Level Means |     |   |
|---------------------------------------|----------------------------------|-----|---|-----------------------------------|-----|---|
|                                       | 1                                | 2   | 3 | 1                                 | 2   | 3 |
| 1. Supporting & connecting            | 1                                |     |   | 1                                 |     |   |
| 2. Problem solving                    | .65                              | 1   |   | .52                               | 1   |   |
| 3. Political savvy/strategic thinking | .68                              | .67 | 1 | .57                               | .66 | 1 |

Correlations between means for importance and skill level for the same sub-scales were moderately low. The correlation was .48 for the two sets of mean scores for supporting and connecting, .53 for problem solving, and .41 for political savvy/strategic thinking.

#### **4.4 Item Responses**

Although the scale scores indicate that these three dimensions of executive behavior are perceived to be very important, each dimension consists of a set of related items. To fully explore the elements in these dimensions, the following tables provide the percent of high and very high responses for each item for both perceived importance and skill level. While a larger proportion of executives than non-executive tended to indicate a behavior as highly important, some behaviors were viewed as important by more non-executives. As would be expected, more executives than non-executives perceived themselves as highly skilled at all but one of the behaviors (ensure understanding). Response percentages for the 29 items omitted from the final scales are provided in Appendix 8.1.

##### **Perceived Importance of Behaviors**

Table 4 contains the percentage of responses in the top two importance ratings (high and very high) for the reduced item set, with items ranked within each category. Item numbers refer to the original numbers as listed on the questionnaire with 55 items. Across all respondents, the four Supporting & Connecting items that were seen as most important by over 75% of the respondents were: (1) strive for clarity (82%), (2) develop employee capabilities (79%), (3) remain open-minded and objective (78%), and (4) encourage participation (75%). These same four behaviors were rated as most important by both the executives and the non-executives, except in different order.

The two Problem Solving items that were rated most important by 75% or more of the respondents were: (1) identify, assess, and manage risk (79%) and (2) acknowledge and manage uncertainty (75%). These were also the top two importance items for both groups, with most of the executives finding these categories of high or very high importance (91.6% and 86.3%, respectively), but a slightly lower percentage of non-executives doing so (86.9% and 81.1%, respectively).

Over 75% of the respondents found three Political Savvy/Strategic Thinking items to be of high or very high importance: (1) know how the political system works (79%), (2) manage multiple demands/opportunities (79%), and (3) manage near-term and long-term goals (76%). These were also the top three importance items for both groups.

##### **Self-assessed Skill Levels**

Table 5 contains the percentage of responses in the top two skill level ratings (high and very high) for the reduced item set, with items ranked within each category. Item numbers refer to the original numbers as listed on the questionnaire with 55 items. Overall, the largest number of respondents said they were highly skilled at striving for clarity (72%) and the smallest number said they were highly skilled at representing/promoting the organizations programs across the political spectrum (40%).

Over three-quarters of the executives rated themselves as highly skilled at five behaviors (3 supporting and connecting and one each from problem solving and political savvy/strategic thinking). In contrast, the highest proportion of non-executives who rated themselves as highly skilled was 71% and this was for only two behaviors (striving for clarity and awareness of self and values).

### **Comparison of Executive and Non-Executive Responses**

Although there was no statistically significant difference between the 95 executives and the 122 non-executives on the three subscale scores, there were some slight differences in the perceived importance rankings of individual items. While over three-quarters of the behaviors were rated as having high or very high importance by a greater percentage of executives than non-executives, some of the behaviors were seen as more important by the non-executive group. However, these differences were all less than three percentage points. The three behaviors rated as important by over 10% more of the executives than the non-executives were: (1) let go of current role to prepare for new ones, (2) assimilate, analyze, and synthesize data and information, and (3) monitor the environment. A larger percentage of executives rated their skill level as high or very high on all but one behavior. But that difference was minor. Slightly more than half of both groups assessed their skill to “ensure understanding” as high or very high (54% of the executives and 52% of the non-executives). See Table 6 for a complete comparison of the two groups.

Within each subset of behaviors, the two groups were in agreement as to the top two important behaviors. In the Supporting and Connecting set, these were: (1) strive for clarity and (2) remain open-minded. In the Problem Solving set, they were: (1) identify, assess, and manage risk and (2) acknowledge and manage uncertainty. In the Political Savvy/Strategic Thinking, they were: (1) know how the political system works, and (2) manage multiple demands/opportunities.

**Table 4 Behaviors ranked by IMPORTANCE within categories (N = 252)**

|   | Total %<br>High and Very High |             |
|---|-------------------------------|-------------|
|   | Importance                    | Skill Level |
| <b>Supporting &amp; Connecting</b>                                      |                               |             |
| 21a. Strive for Clarity   | 81.7                          | 72.2        |
| 8. Develop Employee Capabilities  | 79.0                          | 63.1        |
| 42. Remain Open-Minded and Objective                                    | 77.8                          | 63.1        |
| 27. Encourage Participation   | 75.4                          | 61.1        |
| 10. Aware of Self and Values  | 72.6                          | 69.4        |
| 21b. Ensure Understanding   | 72.6                          | 51.6        |
| 22. Assess Context  | 65.9                          | 49.2        |
| 12. Let Go of Current Role to Prepare for New One                       | 64.3                          | 57.9        |
| 11. Develop Self  | 63.1                          | 49.6        |
| 9. Reduce Distractions  | 60.7                          | 52.8        |
| <b>Problem Solving</b>  |                               |             |
| 40. Identify, Assess, and Manage Risk                                   | 79.0                          | 58.7        |
| 41. Acknowledge and Manage Uncertainty                                  | 74.6                          | 67.1        |
| 38. Validate Facts, Information and Assumptions                         | 71.8                          | 61.1        |
| 39. Consider All Options before Deciding                                | 70.6                          | 60.3        |
| 37. Assimilate, Analyze, and Synthesize Data and Information            | 64.3                          | 57.9        |
| 36. Find Connections and Patterns                                       | 63.5                          | 58.7        |
| <b>Political Savvy/Strategic Thinking</b>                               |                               |             |
| 45. Know How the Political System Works                                 | 79.4                          | 49.2        |
| 48. Manage Multiple Demands/ Opportunities                              | 79.0                          | 58.7        |
| 51. Manage Near-Term and Long-Term Goals                                | 76.2                          | 58.7        |
| 47. Represent/Promote Organization's Programs across Political Spectrum | 72.6                          | 39.7        |
| 50. Maintain an Organization-Wide View                                  | 72.2                          | 61.9        |
| 52. Understand Broad Implications of Activities at Multiple Levels      | 71.4                          | 52.8        |
| 46. Have Political Staying Power  | 70.2                          | 44.0        |
| 54. Use Networks  | 70.2                          | 42.9        |
| 53. Monitor the Environment   | 67.1                          | 44.0        |
| 49. Provide Historical Perspective                                      | 63.1                          | 53.2        |

*Item numbers refer to the original numbers as listed on the questionnaire with 55 items.*

**Table 5 Behaviors ranked by SKILL LEVEL within categories (N = 252)**

|   | Total %<br>High and Very High |             |
|---|-------------------------------|-------------|
|   | Importance                    | Skill Level |
| <b>Supporting &amp; Connecting</b>                                      |                               |             |
| 21a. Strive for Clarity   | 81.7                          | 72.2        |
| 10. Aware of Self and Values  | 72.6                          | 69.4        |
| 8. Develop Employee Capabilities  | 79.0                          | 63.1        |
| 42. Remain Open-Minded and Objective                                    | 77.8                          | 63.1        |
| 27. Encourage Participation   | 75.4                          | 61.1        |
| 12. Let Go of Current Role to Prepare for New One                       | 64.3                          | 57.9        |
| 9. Reduce Distractions  | 60.7                          | 52.8        |
| 21b. Ensure Understanding   | 72.6                          | 51.6        |
| 11. Develop Self  | 63.1                          | 49.6        |
| 22. Assess Context  | 65.9                          | 49.2        |
| <b>Problem Solving</b>  |                               |             |
| 41. Acknowledge and Manage Uncertainty                                  | 74.6                          | 67.1        |
| 38. Validate Facts, Information and Assumptions                         | 71.8                          | 61.1        |
| 39. Consider All Options before Deciding                                | 70.6                          | 60.3        |
| 40. Identify, Assess, and Manage Risk                                   | 79.0                          | 58.7        |
| 36. Find Connections and Patterns                                       | 63.5                          | 58.7        |
| 37. Assimilate, Analyze, and Synthesize Data and Information            | 64.3                          | 57.9        |
| <b>Political Savvy/Strategic Thinking</b>                               |                               |             |
| 50. Maintain an Organization-Wide View                                  | 72.2                          | 61.9        |
| 48. Manage Multiple Demands/ Opportunities                              | 79.0                          | 58.7        |
| 51. Manage Near-Term and Long-Term Goals                                | 76.2                          | 58.7        |
| 49. Provide Historical Perspective                                      | 63.1                          | 53.2        |
| 52. Understand Broad Implications of Activities at Multiple Levels      | 71.4                          | 52.8        |
| 45. Know How the Political System Works                                 | 79.4                          | 49.2        |
| 46. Have Political Staying Power  | 70.2                          | 44.0        |
| 53. Monitor the Environment   | 67.1                          | 44.0        |
| 54. Use Networks  | 70.2                          | 42.9        |
| 47. Represent/Promote Organization's Programs across Political Spectrum | 72.6                          | 39.7        |

*Item numbers refer to the original numbers as listed on the questionnaire with 55 items.*

**Table 6 Comparison of executive & non-executive response percentages**

| <i>Behaviors ranked by IMPORTANCE for EXECUTIVES within categories</i>  | Total % High and Very High |                    |                             |                    |
|---|----------------------------|--------------------|-----------------------------|--------------------|
|   | EXECUTIVES<br>(N = 95)     |                    | NON-EXECUTIVES<br>(N = 122) |                    |
| <b>Supporting &amp; Connecting</b>                                      | <b>Importance</b>          | <b>Skill Level</b> | <b>Importance</b>           | <b>Skill Level</b> |
| 21a. Strive for Clarity   | <b>88.4</b>                | 85.3               | 84.4                        | 70.5               |
| 42. Remain Open-Minded and Objective                                    | <b>87.4</b>                | 76.8               | 86.1                        | 64.8               |
| 27. Encourage Participation   | <b>85.3</b>                | 71.6               | 77.9                        | 60.7               |
| 8. Develop Employee Capabilities  | <b>81.1</b>                | 76.8               | 78.7                        | 60.7               |
| 21b. Ensure Understanding   | 74.7                       | 53.7               | <b>77.0</b>                 | 55.7               |
| 10. Aware of Self and Values  | 72.6                       | 74.7               | <b>76.2</b>                 | 70.5               |
| 12. Let Go of Current Role to Prepare for New One                       | <b>69.5</b>                | 58.9               | 59.0                        | 56.6               |
| 22. Assess Context  | 68.4                       | 55.8               | <b>70.5</b>                 | 48.4               |
| 11. Develop Self  | <b>66.3</b>                | 53.7               | 60.7                        | 50.8               |
| 9. Reduce Distractions  | <b>63.2</b>                | 54.7               | 59.8                        | 50.8               |
| <b>Problem Solving</b>  | <b>Importance</b>          | <b>Skill Level</b> | <b>Importance</b>           | <b>Skill Level</b> |
| 40. Identify, Assess, and Manage Risk                                   | <b>91.6</b>                | 72.6               | 86.9                        | 60.7               |
| 41. Acknowledge and Manage Uncertainty                                  | <b>86.3</b>                | 85.3               | 81.1                        | 67.2               |
| 38. Validate Facts, Information and Assumptions                         | <b>85.3</b>                | 74.7               | 77.9                        | 63.9               |
| 37. Assimilate, Analyze, and Synthesize Data and Information            | <b>78.9</b>                | 69.5               | 66.4                        | 63.1               |
| 39. Consider All Options before Deciding                                | 77.9                       | 70.5               | <b>80.3</b>                 | 64.8               |
| 36. Find Connections and Patterns                                       | <b>72.6</b>                | 73.7               | 70.5                        | 59.0               |
| <b>Political Savvy/Strategic Thinking</b>                               | <b>Importance</b>          | <b>Skill Level</b> | <b>Importance</b>           | <b>Skill Level</b> |
| 48. Manage Multiple Demands/ Opportunities                              | 88.4                       | 68.4               | <b>89.3</b>                 | 63.9               |
| 45. Know How the Political System Works                                 | 88.4                       | 64.2               | <b>90.2</b>                 | 47.5               |
| 51. Manage Near-Term and Long-Term Goals                                | <b>87.4</b>                | 74.7               | 85.2                        | 59.8               |
| 52. Understand Broad Implications of Activities at Multiple Levels      | <b>85.3</b>                | 67.4               | 78.7                        | 54.9               |
| 46. Have Political Staying Power  | <b>84.2</b>                | 55.8               | 76.2                        | 43.4               |
| 47. Represent/Promote Organization's Programs across Political Spectrum | <b>83.2</b>                | 55.8               | 81.1                        | 36.1               |
| 53. Monitor the Environment   | <b>82.1</b>                | 58.9               | 72.1                        | 43.4               |
| 50. Maintain an Organization-Wide View                                  | 80.0                       | 80.0               | <b>82.0</b>                 | 63.1               |
| 54. Use Networks  | 80.0                       | 52.6               | 79.5                        | 43.4               |
| 49. Provide Historical Perspective                                      | <b>71.6</b>                | 68.4               | 70.5                        | 53.3               |

*Item numbers refer to the original numbers as listed on the questionnaire with 55 items.  
 Bold values indicate the larger percentage between two importance and two skill level rankings.*

#### 4.5 Open-ended Comments

An almost equal number of executives (38) and non-executives (33) responded to an open-ended question asking for comments about what it takes to be an effective executive. However, a much higher proportion of executives (40%) than of non-executives (27%) responded, with three comments made by unidentified respondents. A content analysis of the comments was used to organize them into themes. Over half the comments were about executive practices. These were organized into the following categories: lead/manage people; exemplify integrity, honesty, courage; build and act on vision/big picture; listen and communicate; care and understand others; make decisions and delegate; focus on long-range goals; be flexible and keep learning; establish respect. Twelve comments were about executive roles and eight were advice for executives. Additionally, four comments were specific to executives in NASA and five about the survey itself. (See Appendix 8.2 for a complete listing of all the comments.)

Nine comments about leading or managing people dealt with the importance of people skills. The five non-executives were more likely to directly mention “*people skills*” while the four executives broke “people skills” down into more finite behaviors by indicating that one should “*maintain a healthy relationship*” with difficult customers, identify and keep “*high quality people*,” and “*inspire teams to focus on the mission*.”

Seven executives provided direct advice for other executives, such as, “*delegate*,” “*establish clear lines of authority and accountability*,” be willing to take risks, make decisions, and always communicate and lead by example. A non-executive advised to “*keep it simple*.”

## 5.0 Summary and Conclusions

The main purposes of the *Executive Behavior Validation Study* have been accomplished. Although the structure of the original six dimensions found through qualitative observation and interviewing were not substantiated as originally conceived, a subset of the behaviors did realign into three useful dimensions. The new subsets with the reduced item set hold together well both statistically and conceptually. This allowed for a refinement of the questionnaire, which should be useful in many future ventures.

The secondary purpose of quantifying the perceived importance of these behaviors and the levels of self-assessed proficiency for a large group of individuals in executive and managerial positions had extremely positive results. Importance ratings for all three subscales were 4.0 or higher on a 5-point scale. Nine of the 26 behaviors were deemed as having high or very high importance by over three-quarters of the 252 respondents. The rest of the behaviors were deemed highly important by over 60% of all respondents. Over 80% of the executive group rated 16 of the behaviors as having high or very high importance (4 of 10 supporting and communicating behaviors, 3 of 6 problem solving behaviors, and 9 of 10 political savvy/strategic thinking behaviors).

Results with respect to self-assessed skill levels were also gratifying. From over half to 85% of the executives rated themselves as having a high or very high skill level in each behavior. This indicates that while there is certainly room for improvement, these core behaviors are being practiced and practiced reasonably well. As would be expected, the group of non-executives rated their skill levels lower than did the executives. NASA now has a baseline for what skills may need improvement.

## 6.0 Next Steps

Findings from this study provide a refinement of the list of critical behaviors for successful technical executives determined from prior work. These findings will allow NASA to refine training and development and experiential opportunities for individuals moving into executive positions. The revised instrument can be used to assist in formal training sessions for such individuals as well as allow executives to assess their own skills in three main areas.

The revised instrument may also be an invaluable tool in undertaking more elaborate research to gain a better understanding of how executives in technical areas can develop and be successful. When a paper by Morris and Williams (2011) summarizing the results of the second study in this series was presented at the 12<sup>th</sup> International Conference on Human Resource Development, there was an expressed interest from German and Brazilian members of the project management community in creating joint research projects in order to gain an international perspective on importance and skill levels of executive behaviors.

## 7.0 Acknowledgements

Many people have contributed to the success of the study and deserve recognition. In particular we want to express our gratitude to the 252 executives, directors, and managers who gave of their valuable time to respond to a very lengthy questionnaire. It is because of this participation that we are able to advance the understanding of the “art of systems engineering.”

In addition, this study would not have been possible without the support from the following people:

|                       |  |
|-----------------------|--|
| Michael Ryschkewitsch | NASA Chief Engineer  |
| Edward Hoffman        | Director, NASA Academy of Program/Project & Engineering Leadership (APPEL) |

## 8.0 Appendices

### Appendix 8.1 Response percentages for 29 items not in final scales

| <i>Behaviors ranked by IMPORTANCE</i>                               | Total %<br>High and Very High |            |             |
|---|-------------------------------|------------|-------------|
|   | (N = 252)                     | Importance | Skill Level |
| 1. Create Organizational Structure                                  |                               | 93.3       | 79.0        |
| 5. Act Decisively   |                               | 93.3       | 73.4        |
| 3. Manage at the Appropriate Level                                  |                               | 90.5       | 73.8        |
| 2. Gauge Resource Needs to Achieve Mission Objectives               |                               | 90.1       | 74.2        |
| 17. Remain Calm under Pressure                                      |                               | 90.1       | 69.0        |
|   |                               |            |             |
| 4. Accept Change and Be Resilient                                   |                               | 89.7       | 77.8        |
| 6. Inspire and Motivate Team Members to Perform at Peak Performance |                               | 89.7       | 67.7        |
| 7. Build Trust and Respect Confidentiality                          |                               | 89.3       | 87.3        |
| 19. Communicate throughout the Organization                         |                               | 88.1       | 66.7        |
| 24. Practice Effective Speaking and Listening Skills                |                               | 88.1       | 68.3        |
| 15. Organized   |                               | 87.3       | 73.8        |
| 16. Display Self-Confidence and Courage                             |                               | 86.5       | 76.6        |
| 18. Aware of How Personal Presence and Behavior Affects Others      |                               | 84.5       | 67.5        |
| 34. Identify and Define Core Issues/ Problems                       |                               | 80.2       | 72.6        |
|   |                               |            |             |
| 28. Seek Expert Opinion   |                               | 78.6       | 67.5        |
| 26. Link People, Organizations, and Ideas                           |                               | 76.6       | 63.9        |
| 30. Build Relationships through Interaction                         |                               | 75.8       | 59.9        |
| 13. Inquisitive and Curious   |                               | 74.2       | 76.2        |
| 33. Think Systemically  |                               | 74.2       | 72.2        |
| 35. Actively Probe for Information and Understanding                |                               | 73.8       | 64.7        |
| 20. Tailor Messages   |                               | 72.6       | 66.7        |
| 31. Demonstrate Accessibility                                       |                               | 72.6       | 73.4        |
| 29. Build Consensus   |                               | 70.2       | 61.9        |
|   |                               |            |             |
| 43. Use Creativity in Solving Problems                              |                               | 69.4       | 59.5        |
| 44. Draw on Past Experience   |                               | 67.9       | 68.7        |
| 14. Patient   |                               | 67.5       | 57.1        |
| 32. Use Systems Perspective   |                               | 65.1       | 55.6        |
|   |                               |            |             |
| 23. Create Positive Climate   |                               | 58.3       | 71.0        |
| 25. Communicate through Story Telling and Analogies                 |                               | 41.7       | 46.0        |

## Appendix 8.2 Written comments by executives and non-executives

\*

### Executive Practices

#### *Lead/ Manage People*

- 
- E A certain amount of stubbornness is important as well as knowing when to be stubborn and unyielding in your position. Suffering fools gladly is also important, we all have customers that can be irrational or hard to get along with, it is important to know how to deal with these people and maintain a healthy relationship.
- E Identifying and getting high quality people and then keeping them
- E Always complement your own strengths and weaknesses with others who can help the organization be more complete. Not a technical expert? Have them on your staff.
- E Inspire a team to make schedule at high quality, instead of acting like analysts who get to decide whether to do so. Also, inspire teams to focus on the mission and not sub optimize it for institutional agendas. This is a significant issue for us currently.
- NE The higher you rise in management, the more important people skills become. You can delegate implementation/executing tasks to someone else. But you cannot delegate effective people skills to anyone else. You must be able to do that yourself. I would rate having excellent people skills above excellent technical skills because all work is accomplished through people.
- NE It is important to establish trusting partnerships with customer and consumer organizations. Also import to know when to empower employees and when to mentor or lead. Micromanaging is rarely warranted in my experience, and never appreciated. Providing a structure for people to flourish, create an environment that ensures they feel appreciated and valued, and helping them avoid career stagnation is critical to keeping a team productive.
- NE The most important thing to be an effective executive is to have good people leadership skills. It is better to be respected than feared; better to be a good listener than wanting to be heard all the time; better to be humble and come out as a person who has all the right answers....
- NE People skills
- NE You need to be able to influence people at any authority level.
- 

#### *Exemplify Integrity/Honesty/Courage*

- 
- E If you say a contractor must utilize EVMS to manage then understand it and use it yourself. Don't pay lip service to it.
- E Integrity, hard work, drive, dedication
- E Key is Integrity, consistency and willingness to recognize that as an executive we do not have all the answers
- E Act with integrity - treat others with respect. Articulate a vision, establish goals, and communicate the desired future state. Act decisively. Encourage open exchange of ideas.
- NE Honesty and courage
- NE Courage to hold self and other accountable, and integrity--which constitutes dependability and trustworthiness.
- NE A strong desire to do the right thing.
- NE Honesty, integrity, patience, listening, empathy, self-understanding
- 

\* E = comment made by an executive; NE = comment made by a non-executive.

## Appendix 8.2 (continued)

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### *Build and Act on Vision/ Big Picture*

---

- E Vision, bias for action, drive, openness to contrary evidence.
  - E An effective executive has to be able to 'slice and dice' every situation that impacts his/her organization, being able to see the big picture while understanding the details of the moving parts, and fully appreciate the complexities of creating/maintaining a successful organization.
  - E Big picture perspective, with enough solid technical knowledge of the topics to ensure credibility when managing.
  - NE Most important behavior is to have a vision of direction and expectations and make sure that it is shared.
  - NE Must be 100% committed to the ultimate desired outcome (however that is defined), demonstrate this commitment in all actions every day and understand that this outcome is only accomplished by engaging all members of your "team" toward a shared vision of that outcome and each of them at their full potential.  
  
Vision, teamwork, leadership and good organizational skills  
  
Have to maintain a corporate view and know how your task fits in.
- 

### *Listen: Communicate*

---

- E Be able to "actively listen", be intuitive, trust your instincts, and willing to change and adapt - change is the only constant.
  - E In addition to the above - Very good listening and comprehension skills
  - E Collaboration, communication and effective compromise are important when working in a large organization with diverse product lines
  - E Active listening and willingness to be open and share insight and vision
  - E I think the most important skills are listening to be open to what people are trying to tell you, continually learning how to better use the information they are sharing, and training yourself to do the management "processing" (synthesizing, analyzing, organizing, communicating) in an efficient, timely, and collegial manner.
- 

### *Care; Understand Others*

---

- E You have to continually put the needs of the team and the stakeholders ahead of your own personal ambitions and needs. It's more about the team than it is about you.
  - E An ability to fully understand other's perspectives—what motivates, what's important, what's not important—without projecting ones own experiences and feelings.
  - E Be there for your employees and your management and deliver product
  - NE They have to care.
-

## Appendix 8.2 (continued)

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### *Make Decisions and Delegate*

---

- E You will need to tradeoff all of the data and make a decision. It will seldom be unanimous so you cannot wait or it will never get done. Once made you need to stick with it and push to get everyone on board. Believe and they will follow. Pick people you can trust and then trust them. Push. If it turns out to be wrong admit it, adjust it and proceed. Move, don't stand and debate.
  - NE An effective executive needs to be able to delegate responsibility and authority for tasks. This requires the ability to mentor, judge other's capabilities accurately, delegate, trust and make hard decisions (such as replacing someone if they are unable to be mentored to get the work done).
  - NE Trust yourself, listen to informed opinions and do not be afraid to make a decision
  - NE Self-awareness, decisiveness, effective use of team members, delegation, ability to lead and motivate team members, manage near-term and long-term goals, effective communication at all levels.
- 

### *Focus on Long-Range Goals*

---

- E Must always be able to balance the political environment with the long-range goals of the organization and navigate the organization through the political environment toward the long-range goal. Analogy of a sailboat tacking in the wind but always moving toward the objective.
  - E Always make decisions based on the long term impacts and recognize you are in an executive position for the benefit of the program/people/company not your own.
  - NE Be visible, communicate with all levels of employees, and keep focus on long-term strategy while executing on short-term tactical plans.
- 

### *Be Flexible and Keep Learning*

---

- E Need to be flexible and able to adapt to rapidly changing data and political conditions.
  - E Currently I'm working to build my company the... I'm the President of the... and though I work as an executive. My question is that in this vernacular of an executive isn't it easy to lose sight of the big picture? Don't we need to stay connected to other companies to mentor and develop our skills or sharpen our abilities?
  - NE Keep learning.
- 

### *Establish Respect*

---

- E Establish respect of and from subordinates. Lead by example. Listen.
  - E Respect everyone-Treat everyone Fair-Understand your environment- Make decisions--Communicate the organization vision and objectives
  - NE Respect from others and for others should be added.
-

## Appendix 8.2 (continued)

### Executive Roles

- E Key principle: build a common (project) vision then nurture collaboration, promote performance, cultivate learning and, last but not least, ensure results.
- E Transparent and team builder.
- E Proven experiences - there is no substitute for lessons over time
- NE Always have your radar on and be scanning the environment for change. Keep up with the news and how it will affect you and others around you. Keep a positive attitude and be flexible. Be a change master. If something negative takes place, deal with it as effectively as possible, (knowing you won't have all the answers) and try to remember that positive outcomes can arise from negative situations. People tend to bond and work together even more when the going gets tough. Stay focused and avoid gossip and talking about others when they are not present. Perform the best you can each day, knowing that each day will not always be your best. If you fall down, pick yourself up, dust yourself off, and get moving forward again as quickly as possible. Give back what was given to you.
- NE Make sure that the specific executive chosen is suitable for the specific executive role, e.g. a project/programme manager is a very different animal from a financial or a strategic executive.
- NE There are mid-level executive and top executive positions that would change answers based on emphasis. For example, top-level executives are more organizational, vision and big picture focused; mid-level executives are more immediate supervision and implementation focused.
- NE Listen to conflicting opinions with open mind; reassess internal bias.
- NE Requires high level of knowledge, dedication, proficiency and focus on a wide range of technical, political, organizational, and personal behaviors
- NE You need to understand the work and the mission - spaceflight hardware development is unlike any other, if you want to be effective, you have to have done it before.
- NE Understands systems in all dimensions, decisive, anticipatory
- NE Experience.... too many times "clones" are promoted to the executive level because they act and "behave" like their mentor. Management should not be "groomed" but earned through success at differing levels along the way. Give people opportunities to excel - those that excel should be promoted to the next challenge and tested again. When it is obvious that this individual can be challenged and has figured out a way to success then should they be elevated to an executive level. Too many of our "leaders" are promoted due to the old "its not what you know but who you know" method.
- ***Role of Technical Executive***  
Thank you for asking! In my personal view, the role of technical executive leadership does include the items that have been brought up on this listing and it looks very promising to me. Although it may have been mentioned, the distinction between technical executive behaviors and executive behaviors in other disciplines may be the ability to understand what I like to call the artistic temperament of the technical contributor and then providing an environment of safety and sanity that maximizes the productivity of the individuals and groups. Executives of all types face chaotic environments, but I believe that technical executives must protect those whom they are charged to serve by creating what I like to refer to as a cone of sanity in the area of responsibility of the executive. In addition, they must be able to satisfy the curiosity of the technical contributors through the establishment of transparency (which I'm not sure that I saw mentioned directly) into the motivations and considerations of decisions made, visions crafted and directions taken by the executive. My belief is that through this trust can be established, which then increases performance. I believe that technical contributors do not demand that an executive agree with all of their opinions, but they do demand that there is a demonstration that the decisions made are based on some type of logic or rationale. In this way, in these environments, trust is earned through transparency and consistency of behavior that can be construed as rational.

## Appendix 8.2 (continued)

### *Advice for Executives*

- E Need to establish clear lines of authority and accountability  
Roles and responsibilities need to be defined  
Delegate, know what you don't know  
Make decisions
- E Walk the talk  
Recognize your own mistakes; be human.
- E Be a good listener; be available for people to share.  
Don't be afraid to speak the "unspeakable", validate all assumptions.  
Keep the big picture in mind at all times. Make sure to have a clear message when articulating the big picture.  
Delegate, delegate, delegate.
- E Leading by example and always striving to do your best in all aspects of day-to-day career and personal life.
- E Be willing to take risks.  
Put the mission, project or organization ahead of your personal goals.  
Be willing to make decisions based on the information available and be willing to admit if you made the wrong decision and then change it.
- E Listen, collaborate, seek a mutual beneficial position, LEAD - make decisions.  
Experience - training & education cannot replace what is needed in experience (don't be afraid to make mistakes).  
COMMUNICATE
- E Act with integrity - treat others with respect. Articulate a vision, establish goals, and communicate the desired future state. Act decisively. Encourage open exchange of ideas.
- NE Keep things simple.

### *Comments about Executives in NASA*

- E It is important that subordinates do not undercut/sub-optimize the decisions of their superiors.
- E It is important to respect your superior. Unfortunately, some of the NASA executives need to be better at handling decisions.
- NE NASA organizations are not all the same in terms of culture; degree of delegation; roles, responsibilities, and accountabilities and therefore being effective can be context-specific. Also, this survey only implicitly addresses attacking organizational and cultural "stovepipes" or "silos" which is probably our number 1 stumbling block to greater effectiveness.
- NE Effective leaders require the support from the organization and Agency.

### *Comments about the Survey*

- E Q53 (Monitor the environment) is highly dependent on the context for its importance.
- NE You have an excellent list of executive behavioral attributes.
- NE Surprised that there was not a question on dealing with the politics of the agency and making sure it does not impede on the objectives of the agency.
- NE The designer of this survey clearly understands what it takes to effectively lead a NASA program or project
- NE Thank you for the opportunity to feedback. I responded as best as possible, as I do not have responsibility at the executive level. However, as a project manager there are several of the behaviors that I was able to address.

\* E = comment made by an executive; NE = comment made by a non-executive.

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